

CLAIMS

1. A vehicle tubing comprising:
a tubing including a layer of aromatic polyamide defining a conduit.
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2. The vehicle tubing as recited in Claim 1, including a second layer of a thermoplastic material bonded to the layer of aromatic polyamide.
3. The vehicle tubing as recited in Claim 2, wherein the second layer of
10 thermoplastic material includes at least one of aromatic polyamide, polypropylene, polyethylene, fluoropolymer, polyamide, and mixtures thereof.
4. The vehicle tubing as recited in Claim 2, wherein the second layer of thermoplastic material is an outer layer having an outer layer thickness and the
15 tubing has a total thickness, and the outer layer thickness comprises between approximately 50% and 95% of the total thickness.
5. The vehicle tubing as recited in Claim 2, including an intermediate thermoplastic layer located between the layer of aromatic polyamide and the second
20 layer of thermoplastic material.
6. The vehicle tubing as recited in Claim 2, wherein the layer of aromatic polyamide includes an outer surface and the second layer of thermoplastic material includes an inner surface, and the outer surface of the second layer of thermoplastic
25 material contacts the inner surface of the layer of aromatic polyamide.
7. The vehicle tubing as recited in Claim 1, wherein aromatic polyamide of the layer of aromatic polyamide includes a chemical repeat unit having an amide group and an aromatic ring, and the amide group is attached to the aromatic ring.
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8. The vehicle tubing as recited in Claim 1, wherein aromatic polyamide of the layer of aromatic polyamide includes amide groups and aromatic rings, and at least a portion of the amide groups are attached to aromatic rings.

9. The vehicle tubing as recited in Claim 8, wherein at least 50% of the amide groups are attached to aromatic rings.
10. The vehicle tubing as recited in Claim 8, wherein the aromatic polyamide of the layer of aromatic polyamide includes at least one of an impact-modifying agent, a heat-stabilizing agent, a heat-stabilizing agent, and a color pigment.
11. The vehicle tubing as recited in Claim 1, wherein the layer of aromatic polyamide includes a conductive material and has an electric surface resistivity between approximately 10^2 and 10^7 ohms/square.
12. The vehicle tubing as recited in Claim 11, wherein the conductive material includes at least one of carbon powder, carbon fiber, carbon nanotubes, metal fiber, metal powder, and mixtures thereof.
13. The vehicle tubing as recited in Claim 1, wherein the layer of aromatic polyamide includes a corrugated outer surface.
14. A vehicle tubing comprising:
a first layer of a first thermoplastic material including a corrugated outer surface portion; and
a second layer of a second thermoplastic material bonded to the first layer, wherein at least one of the first thermoplastic material and the second thermoplastic material includes an aromatic polyamide.
15. The vehicle tubing as recited in Claim 14, wherein the second layer includes a corrugated inner portion and a corrugated outer surface portion that correspond to the corrugated outer surface portion of the first layer.
16. The vehicle tubing as recited in Claim 14, wherein the second layer includes a non-corrugated inner surface portion and a corrugated outer surface portion that corresponds to the corrugated outer surface portion of the first layer.

17. The vehicle tubing as recited in Claim 16, wherein the tubing includes a length, the first layer has a first wall thickness and the second layer has a second wall thickness, and one of the first wall thickness and the second wall thickness is essentially constant over the length of the tubing and the other of the first wall thickness and the second wall thickness changes over the length of the tubing.

18. The vehicle tubing as recited in Claim 16, wherein the first layer includes a non-corrugated outer surface portion adjacent to the corrugated outer surface portion.

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19. The vehicle tubing as recited in Claim 18, wherein the tubing includes a length, and the length includes alternating non-corrugated outer surface portions and corrugated outer surface portions.

20. The vehicle tubing as recited in Claim 14, wherein the first layer and the second layer both include an aromatic polyamide.

21. A method of resisting permeation of a fluid through a tubing wall comprising the steps of:

20 extruding the aromatic polyamide into an aromatic polyamide layer that forms a conduit.

22. The method as recited in Claim 21, including the steps of extruding a second aromatic polyamide layer coaxially with the layer of aromatic polyamide layer, and bonding the second aromatic polyamide layer to the aromatic polyamide layer.

23. The method as recited in Claim 22, including the step of bonding the second aromatic polyamide layer to the aromatic polyamide layer with an intermediate thermoplastic layer located between the second aromatic polyamide layer and the aromatic polyamide layer.

24. The method as recited in Claim 21, including the step of forming a corrugated outer surface on the aromatic polyamide layer.

25. The method as recited in Claim 21, including the step of adding at least one of carbon powder, carbon fiber, carbon nanotubes, metal fiber, metal powder, heat-stabilizing agent, impact-modifying agent, and mixtures thereof to the aromatic polyamide before extruding the aromatic polyamide layer.

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26. A vehicle tubing comprising:
a first layer of aromatic polyamide; and
a second layer of aromatic polyamide bonded to the first layer of aromatic polyamide.

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27. The tubing as recited in Claim 26, including an intermediate thermoplastic layer between the first layer of aromatic polyamide and the second layer of aromatic polyamide.

15 28. The tubing as recited in Claim 26, wherein at least one of the first layer of aromatic polyamide and the second layer of aromatic polyamide includes at least one of an impact-modifying agent, a heat stabilizing agent, a color pigment, and mixtures thereof.

20 29. The vehicle tubing as recited in Claim 26, wherein the first layer of aromatic polyamide is an inner layer relative to the second layer of aromatic polyamide, and the first layer of aromatic polyamide includes a conductive material and has an electric surface resistivity between approximately 10^2 and 10^7 ohms/square.

25 30. The vehicle tubing as recited in Claim 29, wherein the conductive material includes at least one of carbon powder, carbon fiber, carbon nanotubes, metal fiber, metal powder, and mixtures thereof.